



## SEQUENCE LISTING

<110> Habener, Joel  
Zulewski, Hendrik  
Abraham, Elizabeth  
Vallejo, Mario

<120> STEM CELLS OF THE ISLETS OF LANGERHANS AND THEIR USE

<130> 17633/1230

<140> US 09/731,261  
<141> 2000-12-06

<150> US 60/169,082  
<151> 1999-12-06

<150> US 60/215,109  
<151> 2000-06-28

<150> US 60/239,880  
<151> 2000-10-06

<160> 55

<170> PatentIn version 3.1

<210> 1  
<211> 4854  
<212> DNA  
<213> Homo sapiens

<400> 1  
atggagggct gcatggggga ggagtcgtt cagatgtggg agctcaatcg gcgcctggag 60  
gcctacctgg gccgggtcaa ggcgctggag gagcagaatg agctgctcag cgccggactc 120  
ggggggctcc ggcgacaatc cgcggacacc tcctggcggg cgcattgccga cgacgagctg 180  
gcggccctgc gtgcgctcgt tgaccaacgc tggcgggaga agcacgcggc cgaggtggcg 240  
cgcgacaacc tggctgaaga gctggagggc gtggcaggcc gatgcgagca gctgcggctg 300  
gcccgggagc ggacgacgga ggaggttagcc cgcaaccggc gcggcgtcga ggcagagaaa 360  
tgcgcccggg cctggctgag tagccagggg gcagagctgg agcgcgagct agaggctcta 420  
cgcgtggcgc acgaggagga ggcgcgtcggt ctgaacgcgc aggctgcctg tgccccccgc 480  
ctgcccggc cgccccggcc tcccgcccg gccccggagg tagaggagct ggcaaggcga 540  
ctgggcgagg cgtggcgcgg ggcagtgcgc ggctaccagg agcgcgtggc acacatggag 600  
acgtcgctgg accagacccg cgagcgcctg gcccggcgg tgcagggtgc ccgcgaggc 660  
cgccctggagc tgcagcagct ccaggctgag cgcggaggcc tcctggagcg cagggcagcg 720  
ttggaacaga gttggaggg ccgctggcag gagcggctgc gggctactga aaagttccag 780  
ctggctgtgg aggccctgga gcaggagaaa cagggcctac agagccagat cgctcaggc 840  
ctggaaggc ggcagcagct ggcgcaccc aagatgtccc tcagcctgga ggtggccacg 900  
tacaggaccc tcctggaggc tgagaactcc cggctgcaaa caccctggcgg tggctccaag 960

acttcctca gcttcagga cccaaatgt gagctgcaat tccctaggac cccagaggc 1020  
cggcgcttg gatcttgc cccagtcctg agcccaactt ccctcccctc acccttgcct 1080  
gctacccttg agacacctgt gccagcctt cttagaacc aagaattcct ccaggcccgt 1140  
acccctacct tggccagcac ccccatcccc cccacacctc aggacccctc tcctgctgta 1200  
gatcagaga tcagagccca ggatgctcct ctctctctgc tccagacaca gggtgggagg 1260  
aaacaggctc cagagccct gcgggctgaa gccagggtgg ccattcctgc cagcgtcctg 1320  
cctggaccag aggagcctgg gggccagcgg caagaggcca gtacaggcca gtccccagag 1380  
gaccatgcct cttggcacc acccctcagc cctgaccact ccagtttaga ggctaaggat 1440  
ggagaatccg gtgggtctag agtggcagc atatgccag gggaaaggta agggcaaatc 1500  
tgggggttgg tagagaaaaga aacagccata gagggcaaag tggttaagcag cttgcagcag 1560  
gaaatatggg aagaagagga tctaaacagg aaggaaatcc aggactccca gttcccttg 1620  
aaaaaaagaaa ccctgaagtc tctggagag gagattcaag agtcaactgaa gactctggaa 1680  
aaccagagcc atgagacact agaaaggag aatcaagaat gtccgaggc tttagaagaa 1740  
gacttagaaa cactaaaaag tctagaaaag gaaaataaaa gagctattaa aggatgtgga 1800  
gttagtgaga cctctagaaa aagaggctgt aggcaactt agcctacagg aaaagaggac 1860  
acacagacat tgcaatccct gcaaaaggag aatcaagaac taatgaaatc tcttgaaggt 1920  
aatctagaga catttttatt tccaggaacg gaaaatcaag aattagtaag ttctctgcaa 1980  
gagaacttag agtcattgac agctctggaa aaggagaatc aagagccact gagatctcca 2040  
gaagtagggg atgaggaggc actgagacct ctgacaaagg agaatcagga acccctgagg 2100  
tctcttgaag atgagaacaa agaggcctt agatctctag aaaaagagaa ccaggagcca 2160  
ctgaagactc tagaagaaga ggaccagagt attgtgagac ctctagaaac agagaatcac 2220  
aaatcaactga ggtctttaga agaacaggac caagagacat tgagaactct tgaaaaagag 2280  
actcaacagc gacggaggc tctagggaa caggatcaga tgacattaag acccccagaa 2340  
aaagtggatc tagaaccact gaagtctctt gaccaggaga tagcttagacc tcttggaaat 2400  
gagaatcaag agttcttaaa gtcactcaaa gaagagagcg tagaggcagt aaaatctta 2460  
gaaacagaga tcctagaatc actgaagtct gcgggacaag agaacctgga aacactgaaa 2520  
tctccagaaa ctaagcacc actgtggact ccagaagaaa taaataaatc agggggcaat 2580  
gaatccctta gaaaaggaaa ttcaagaacc actggagtct gtggaagtga accaagagac 2640  
attcagactc ctggaagagg agaatcagga atcattgaga tctctggag catggaacct 2700  
ggagaatttg agatctccag aggatagac aaggaaagtc aaaggaatct ggaagaggaa 2760  
gagaacctgg gaaagggaga gtaccaagag tcactgaggt ctctggagga ggagggacag 2820  
gagctgccgc agtctgcaga tgtgcagagg tgggaagata cggtggagaa ggaccaagaa 2880

|   |      |
|---|------|
| ctggctcagg aaagccctcc tgggatggct ggagtggaaa ataaggatga ggcagagctg       | 2940 |
| aatctaaggg agcaggatgg cttcaactggg aaggaggagg tggtagagca gggagagctg      | 3000 |
| aatgccacag aggaggtctg gttcccaggc gaggggcacc cagagaaccc tgagccaaa        | 3060 |
| gagcagagag gcctgggtga gggagccagt gtgaaggagag gggctgaggg cctccaggac      | 3120 |
| cctgaagggc aatcacaaca ggtggggacc ccaggccctcc aggctccccca ggggctgcca     | 3180 |
| gaggcgtatag agcccccttgtt ggaagatgtat gtggcccccag ggggtgacca agcctccccca | 3240 |
| gaggtcatgt tggggtcaga gcctgcccattt ggtgagtctg ctgcgggagc tgagccaggc     | 3300 |
| ctggggcagg ggggtggagg gctgggggac ccaggccatc tgaccaggaa agaggtatg        | 3360 |
| gaaccacccc tggaaagagga gagttggag gcaaagaggg ttcaaggctt ggaaggccct       | 3420 |
| agaaaggacc tagaggaggc aggtggtctg gggacagagt tctccgagct gcctgggaag       | 3480 |
| agcagagacc cttgggagcc tcccaggag ggttagggagg agtcagaggc tgaggccccc       | 3540 |
| aggggagcag aggaggcggtt ccctgcttag accctgggccc acactggaa tgatccccct      | 3600 |
| tcaccttggc ctctgggttc agaggaagct gaggaggatg taccaccagt gctggcttcc       | 3660 |
| cccagcccaa cgtacacccc gatcctggaa gatgccccctg ggctccagcc tcaggctgaa      | 3720 |
| gggagtcagg aggctagctg ggggggtgcag gggagggctg aagctggaa agtagagagc       | 3780 |
| gagcaggagg agttgggttc tggggagatc cccgagggccc tccaggagga aggggaggag      | 3840 |
| agcagagaag agagcgagga ggatgagctc gggagaccc ttccagactc cactccccctg       | 3900 |
| ggcttctacc tcaggtcccc cacctcccc aggtggaccc cactggagag cagaggccac        | 3960 |
| cccctcaagg agactggaaa ggagggctgg gatcctgttg tcctggcttc cgagggcctt       | 4020 |
| gaggaacctt cagaaaagga ggagggggag gagggagaag aggagtgtgg ccgtactct        | 4080 |
| gacctgtcag aagaatttga ggacctgggg actgaggcac ctttcttcc tggggccctt        | 4140 |
| ggggaggtgg cagaacctct gggccagggtg ccccaagctgc tactggatcc tgcagcctgg     | 4200 |
| gatcgagatg gggagtctga tgggttgca gatgaggaag aaagtggggaa ggagggagag       | 4260 |
| gaggatcagg aggagggggag ggagccaggg gctgggcggt gggggccagg gtcttctgtt      | 4320 |
| ggcagcctcc aggcccttag tagctccctag agagggaaat tcctggagtc tgattctgtta     | 4380 |
| agtgtcagcg tccccctggaa tgacagcttggagggatg tggctgggtgc ccccaagact        | 4440 |
| gccctggaaa cggagtccca ggacagtgtctg gaccccttgc gctcagagga agagtctgac     | 4500 |
| cctgtttccct tggagagggaa ggacaaagtc cctggccctc tagagatccc cagtggatg      | 4560 |
| gaggatgcag gcccaggggc agacatcatt ggtgttaatg gccagggtcc caacttggag       | 4620 |
| gggaagtcaac agcatgtaaa tgggggagta atgaacgggc tggagcagtc tgaggaaagt      | 4680 |
| ggggcaagga atgcgctagt ctctgaggga gaccgaggga gccccttca ggaggaggag        | 4740 |
| gggagtgcctc tgaagaggtc ttcggcagggtc gctcctgttc acctggccca gggtcagttc    | 4800 |

ctgaagttca ctcagaggga aggagataga gagtcctggt cctcagggga ggac 4854

<210> 2

<211> 1618

<212> PRT

<213> Homo sapiens

<400> 2

Met Glu Gly Cys Met Gly Glu Glu Ser Phe Gln Met Trp Glu Leu Asn  
1 5 10 15

Arg Arg Leu Glu Ala Tyr Leu Gly Arg Val Lys Ala Leu Glu Glu Gln  
20 25 30

Asn Glu Leu Leu Ser Ala Gly Leu Gly Gly Leu Arg Arg Gln Ser Ala  
35 40 45

Asp Thr Ser Trp Arg Ala His Ala Asp Asp Glu Leu Ala Ala Leu Arg  
50 55 60

Ala Leu Val Asp Gln Arg Trp Arg Glu Lys His Ala Ala Glu Val Ala  
65 70 75 80

Arg Asp Asn Leu Ala Glu Glu Leu Glu Gly Val Ala Gly Arg Cys Glu  
85 90 95

Gln Leu Arg Leu Ala Arg Glu Arg Thr Thr Glu Glu Val Ala Arg Asn  
100 105 110

Arg Arg Ala Val Glu Ala Glu Lys Cys Ala Arg Ala Trp Leu Ser Ser  
115 120 125

Gln Gly Ala Glu Leu Glu Arg Glu Leu Glu Ala Leu Arg Val Ala His  
130 135 140

Glu Glu Glu Arg Val Gly Leu Asn Ala Gln Ala Ala Cys Ala Pro Arg  
145 150 155 160

Leu Pro Ala Pro Pro Arg Pro Pro Ala Pro Ala Pro Glu Val Glu Glu  
165 170 175

Leu Ala Arg Arg Leu Gly Glu Ala Trp Arg Gly Ala Val Arg Gly Tyr  
180 185 190

Gln Glu Arg Val Ala His Met Glu Thr Ser Leu Asp Gln Thr Arg Glu  
195 200 205

Arg Leu Ala Arg Ala Val Gln Gly Ala Arg Glu Val Arg Leu Glu Leu  
Page 4

210

215

220

Gln Gln Leu Gln Ala Glu Arg Gly Gly Leu Leu Glu Arg Arg Ala Ala  
225 230 235 240

Leu Glu Gln Arg Leu Glu Gly Arg Trp Gln Glu Arg Leu Arg Ala Thr  
245 250 255

Glu Lys Phe Gln Leu Ala Val Glu Ala Leu Glu Gln Glu Lys Gln Gly  
260 265 270

Leu Gln Ser Gln Ile Ala Gln Val Leu Glu Gly Arg Gln Gln Leu Ala  
275 280 285

His Leu Lys Met Ser Leu Ser Leu Glu Val Ala Thr Tyr Arg Thr Leu  
290 295 300

Leu Glu Ala Glu Asn Ser Arg Leu Gln Thr Pro Gly Gly Ser Lys  
305 310 315 320

Thr Ser Leu Ser Phe Gln Asp Pro Lys Leu Glu Leu Gln Phe Pro Arg  
325 330 335

Thr Pro Glu Gly Arg Arg Leu Gly Ser Leu Leu Pro Val Leu Ser Pro  
340 345 350

Thr Ser Leu Pro Ser Pro Leu Pro Ala Thr Leu Glu Thr Pro Val Pro  
355 360 365

Ala Phe Leu Lys Asn Gln Glu Phe Leu Gln Ala Arg Thr Pro Thr Leu  
370 375 380

Ala Ser Thr Pro Ile Pro Pro Thr Pro Gln Ala Pro Ser Pro Ala Val  
385 390 395 400

Asp Ala Glu Ile Arg Ala Gln Asp Ala Pro Leu Ser Leu Leu Gln Thr  
405 410 415

Gln Gly Gly Arg Lys Gln Ala Pro Glu Pro Leu Arg Ala Glu Ala Arg  
420 425 430

Val Ala Ile Pro Ala Ser Val Leu Pro Gly Pro Glu Glu Pro Gly Gly  
435 440 445

Gln Arg Gln Glu Ala Ser Thr Gly Gln Ser Pro Glu Asp His Ala Ser  
450 455 460

Leu Ala Pro Pro Leu Ser Pro Asp His Ser Ser Leu Glu Ala Lys Asp  
Page 5

465

470

475

480

Gly Glu Ser Gly Gly Ser Arg Val Phe Ser Ile Cys Arg Gly Glu Gly  
485 490 495

Glu Gly Gln Ile Trp Gly Leu Val Glu Lys Glu Thr Ala Ile Glu Gly  
500 505 510

Lys Val Val Ser Ser Leu Gln Gln Glu Ile Trp Glu Glu Glu Asp Leu  
515 520 525

Asn Arg Lys Glu Ile Gln Asp Ser Gln Val Pro Leu Glu Lys Glu Thr  
530 535 540

Leu Lys Ser Leu Gly Glu Glu Ile Gln Glu Ser Leu Lys Thr Leu Glu  
545 550 555 560

Asn Gln Ser His Glu Thr Leu Glu Arg Glu Asn Gln Glu Cys Pro Arg  
565 570 575

Ser Leu Glu Glu Asp Leu Glu Thr Leu Lys Ser Leu Glu Lys Glu Asn  
580 585 590

Lys Arg Ala Ile Lys Gly Cys Gly Gly Ser Glu Thr Ser Arg Lys Arg  
595 600 605

Gly Cys Arg Gln Leu Lys Pro Thr Gly Lys Glu Asp Thr Gln Thr Leu  
610 615 620

Gln Ser Leu Gln Lys Glu Asn Gln Glu Leu Met Lys Ser Leu Glu Gly  
625 630 635 640

Asn Leu Glu Thr Phe Leu Phe Pro Gly Thr Glu Asn Gln Glu Leu Val  
645 650 655

Ser Ser Leu Gln Glu Asn Leu Glu Ser Leu Thr Ala Leu Glu Lys Glu  
660 665 670

Asn Gln Glu Pro Leu Arg Ser Pro Glu Val Gly Asp Glu Glu Ala Leu  
675 680 685

Arg Pro Leu Thr Lys Glu Asn Gln Glu Pro Leu Arg Ser Leu Glu Asp  
690 695 700

Glu Asn Lys Glu Ala Phe Arg Ser Leu Glu Lys Glu Asn Gln Glu Pro  
705 710 715 720

Leu Lys Thr Leu Glu Glu Glu Asp Gln Ser Ile Val Arg Pro Leu Glu  
Page 6

725

730

735

Thr Glu Asn His Lys Ser Leu Arg Ser Leu Glu Glu Gln Asp Gln Glu  
740 745 750

Thr Leu Arg Thr Leu Glu Lys Glu Thr Gln Gln Arg Arg Arg Ser Leu  
755 760 765

Gly Glu Gln Asp Gln Met Thr Leu Arg Pro Pro Glu Lys Val Asp Leu  
770 775 780

Glu Pro Leu Lys Ser Leu Asp Gln Glu Ile Ala Arg Pro Leu Glu Asn  
785 790 795 800

Glu Asn Gln Glu Phe Leu Lys Ser Leu Lys Glu Glu Ser Val Glu Ala  
805 810 815

Val Lys Ser Leu Glu Thr Glu Ile Leu Glu Ser Leu Lys Ser Ala Gly  
820 825 830

Gln Glu Asn Leu Glu Thr Leu Lys Ser Pro Glu Thr Gln Ala Pro Leu  
835 840 845

Trp Thr Pro Glu Glu Ile Asn Lys Ser Gly Gly Asn Glu Ser Ser Arg  
850 855 860

Lys Gly Asn Ser Arg Thr Thr Gly Val Cys Gly Ser Glu Pro Arg Asp  
865 870 875 880

Ile Gln Thr Pro Gly Arg Gly Glu Ser Gly Ile Ile Glu Ile Ser Gly  
885 890 895

Ser Met Glu Pro Gly Glu Phe Glu Ile Ser Arg Gly Val Asp Lys Glu  
900 905 910

Ser Gln Arg Asn Leu Glu Glu Glu Asn Leu Gly Lys Gly Glu Tyr  
915 920 925

Gln Glu Ser Leu Arg Ser Leu Glu Glu Gly Gln Glu Leu Pro Gln  
930 935 940

Ser Ala Asp Val Gln Arg Trp Glu Asp Thr Val Glu Lys Asp Gln Glu  
945 950 955 960

Leu Ala Gln Glu Ser Pro Pro Gly Met Ala Gly Val Glu Asn Lys Asp  
965 970 975

Glu Ala Glu Leu Asn Leu Arg Glu Gln Asp Gly Phe Thr Gly Lys Glu  
Page 7

980

985

990

Glu Val Val Glu Gln Gly Glu Leu Asn Ala Thr Glu Glu Val Trp Phe  
995 1000 1005

Pro Gly Glu Gly His Pro Glu Asn Pro Glu Pro Lys Glu Gln Arg  
1010 1015 1020

Gly Leu Val Glu Gly Ala Ser Val Lys Gly Gly Ala Glu Gly Leu  
1025 1030 1035

Gln Asp Pro Glu Gly Gln Ser Gln Gln Val Gly Thr Pro Gly Leu  
1040 1045 1050

Gln Ala Pro Gln Gly Leu Pro Glu Ala Ile Glu Pro Leu Val Glu  
1055 1060 1065

Asp Asp Val Ala Pro Gly Gly Asp Gln Ala Ser Pro Glu Val Met  
1070 1075 1080

Leu Gly Ser Glu Pro Ala Met Gly Glu Ser Ala Ala Gly Ala Glu  
1085 1090 1095

Pro Gly Leu Gly Gln Gly Val Gly Gly Leu Gly Asp Pro Gly His  
1100 1105 1110

Leu Thr Arg Glu Glu Val Met Glu Pro Pro Leu Glu Glu Glu Ser  
1115 1120 1125

Leu Glu Ala Lys Arg Val Gln Gly Leu Glu Gly Pro Arg Lys Asp  
1130 1135 1140

Leu Glu Glu Ala Gly Gly Leu Gly Thr Glu Phe Ser Glu Leu Pro  
1145 1150 1155

Gly Lys Ser Arg Asp Pro Trp Glu Pro Pro Arg Glu Gly Arg Glu  
1160 1165 1170

Glu Ser Glu Ala Glu Ala Pro Arg Gly Ala Glu Glu Ala Phe Pro  
1175 1180 1185

Ala Glu Thr Leu Gly His Thr Gly Ser Asp Ala Pro Ser Pro Trp  
1190 1195 1200

Pro Leu Gly Ser Glu Glu Ala Glu Glu Asp Val Pro Pro Val Leu  
1205 1210 1215

Val Ser Pro Ser Pro Thr Tyr Thr Pro Ile Leu Glu Asp Ala Pro  
Page 8

1220                    1225                    1230  
Gly Leu Gln Pro Gln Ala Glu Gly Ser Gln Glu Ala Ser Trp Gly  
1235                    1240                    1245  
  
Val Gln Gly Arg Ala Glu Ala Gly Lys Val Glu Ser Glu Gln Glu  
1250                    1255                    1260  
  
Glu Leu Gly Ser Gly Glu Ile Pro Glu Gly Leu Gln Glu Glu Gly  
1265                    1270                    1275  
  
Glu Glu Ser Arg Glu Glu Ser Glu Glu Asp Glu Leu Gly Glu Thr  
1280                    1285                    1290  
  
Leu Pro Asp Ser Thr Pro Leu Gly Phe Tyr Leu Arg Ser Pro Thr  
1295                    1300                    1305  
  
Ser Pro Arg Trp Thr Pro Leu Glu Ser Arg Gly His Pro Leu Lys  
1310                    1315                    1320  
  
Glu Thr Gly Lys Glu Gly Trp Asp Pro Ala Val Leu Ala Ser Glu  
1325                    1330                    1335  
  
Gly Leu Glu Glu Pro Ser Glu Lys Glu Glu Gly Glu Glu Gly Glu  
1340                    1345                    1350  
  
Glu Glu Cys Gly Arg Asp Ser Asp Leu Ser Glu Glu Phe Glu Asp  
1355                    1360                    1365  
  
Leu Gly Thr Glu Ala Pro Phe Leu Pro Gly Val Pro Gly Glu Val  
1370                    1375                    1380  
  
Ala Glu Pro Leu Gly Gln Val Pro Gln Leu Leu Leu Asp Pro Ala  
1385                    1390                    1395  
  
Ala Trp Asp Arg Asp Gly Glu Ser Asp Gly Phe Ala Asp Glu Glu  
1400                    1405                    1410  
  
Glu Ser Gly Glu Glu Gly Glu Glu Asp Gln Glu Glu Gly Arg Glu  
1415                    1420                    1425  
  
Pro Gly Ala Gly Arg Trp Gly Pro Gly Ser Ser Val Gly Ser Leu  
1430                    1435                    1440  
  
Gln Ala Leu Ser Ser Ser Gln Arg Gly Glu Phe Leu Glu Ser Asp  
1445                    1450                    1455  
  
Ser Val Ser Val Ser Val Pro Trp Asp Asp Ser Leu Arg Gly Ala

1460                    1465                    1470  
Val Ala Gly Ala Pro Lys Thr Ala Leu Glu Thr Glu Ser Gln Asp  
1475                    1480                    1485  
  
Ser Ala Glu Pro Ser Gly Ser Glu Glu Glu Ser Asp Pro Val Ser  
1490                    1495                    1500  
  
Leu Glu Arg Glu Asp Lys Val Pro Gly Pro Leu Glu Ile Pro Ser  
1505                    1510                    1515  
  
Gly Met Glu Asp Ala Gly Pro Gly Ala Asp Ile Ile Gly Val Asn  
1520                    1525                    1530  
  
Gly Gln Gly Pro Asn Leu Glu Gly Lys Ser Gln His Val Asn Gly  
1535                    1540                    1545  
  
Gly Val Met Asn Gly Leu Glu Gln Ser Glu Glu Ser Gly Ala Arg  
1550                    1555                    1560  
  
Asn Ala Leu Val Ser Glu Gly Asp Arg Gly Ser Pro Phe Gln Glu  
1565                    1570                    1575  
  
Glu Glu Gly Ser Ala Leu Lys Arg Ser Ser Ala Gly Ala Pro Val  
1580                    1585                    1590  
  
His Leu Gly Gln Gly Gln Phe Leu Lys Phe Thr Gln Arg Glu Gly  
1595                    1600                    1605  
  
Asp Arg Glu Ser Trp Ser Ser Gly Glu Asp  
1610                    1615

<210> 3  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 3  
gcggggcggt gcgtgactac

20

<210> 4  
<211> 24  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 4

aggcaagggg gaagagaagg atgt

24

<210> 5  
<211> 35  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 5  
aagctgaagc cgaatttcct tgggataccca gagga

35

<210> 6  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 6  
acagccagta cttcaagacc

20

<210> 7  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 7  
ctgtgtcagc acgcacgtta

20

<210> 8  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 8  
tggattccac accaggcatt gaccatgccca

30

<210> 9  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 9  
cagcggttggaa gagtccaaat

20

<210> 10

<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 10  
ttaaactcct gtggggttgg

20

<210> 11  
<211> 37  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 11  
aaaccagcag cggatctcag tggtgtggaa cgatgat

37

<210> 12  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 12  
atcaactggag cagggaaagt

19

<210> 13  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 13  
gctactacgt ttcttatct

19

<210> 14  
<211> 19  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 14  
gcgtggaaaa gccagtggg

19

<210> 15  
<211> 18  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer  
  
<400> 15  
agaggggaaat tcctggag 18

<210> 16  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer  
  
<400> 16  
ctgaggacca ggactctcta 20

<210> 17  
<211> 31  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer  
  
<400> 17  
tatgaacggg ctggagcagt ctgaggaaag t 31

<210> 18  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer  
  
<400> 18  
cttttcgcgc gcccagcatt 20

<210> 19  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer  
  
<400> 19  
gattttcctg tccctcgagc 20

<210> 20  
<211> 30  
<212> DNA  
<213> Artificial Sequence .

<220>  
<223> Primer  
  
<400> 20

aaccatgagg aggaaatcag tacgctgagg

30

<210> 21  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 21  
atctggactc caggcgtgcc

20

<210> 22  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 22  
agcaatgaat tccttggcag

20

<210> 23  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 23  
cacgatgaat ttgagagaca tgctgaaggg

30

<210> 24  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 24  
agaacagcac gtacacagcc

20

<210> 25  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 25  
cctccgaaga aacagcaaga

20

<210> 26

<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 26  
tctcccttca cagcagaact aacacacggg

30

<210> 27  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 27  
gcagtcctgc catcaatgtg

20

<210> 28  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 28  
gttggctgtg aataccacct

20

<210> 29  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 29  
ctggagagct gcatgggctc acaactgagg

30

<210> 30  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 30  
gactttccag cagtcccata

20

<210> 31  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220> 31  
<223> Primer  
gtttacttcc tgcagggAAC 20

<210> 32  
<211> 31  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 32  
ttgcactgga gaaggattac gtggcgTTCT A 31

<210> 33  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 33  
tgaaggcGAG aaggTgttCC 20

<210> 34  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 34  
ttcgagatac aggCAGATAT 20

<210> 35  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 35  
agttagactt ttatgtcctg ccttgctca 30

<210> 36  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 36

|                                  |    |
|----------------------------------|----|
| cttcaggctg caccaagtgt            | 20 |
| <210> 37                         |    |
| <211> 20                         |    |
| <212> DNA                        |    |
| <213> Artificial Sequence        |    |
| <220>                            |    |
| <223> Primer                     |    |
| <400> 37                         |    |
| gttgaccata gtcaggctgg            | 20 |
| <210> 38                         |    |
| <211> 30                         |    |
| <212> DNA                        |    |
| <213> Artificial Sequence        |    |
| <220>                            |    |
| <223> Primer                     |    |
| <400> 38                         |    |
| gtcagatgtg aagatggcca cagacccaga | 30 |
| <210> 39                         |    |
| <211> 20                         |    |
| <212> DNA                        |    |
| <213> Artificial Sequence        |    |
| <220>                            |    |
| <223> Primer                     |    |
| <400> 39                         |    |
| gcatcaaatg tcagccctgg            | 20 |
| <210> 40                         |    |
| <211> 20                         |    |
| <212> DNA                        |    |
| <213> Artificial Sequence        |    |
| <220>                            |    |
| <223> Primer                     |    |
| <400> 40                         |    |
| caacgctgac atggaattcc            | 20 |
| <210> 41                         |    |
| <211> 30                         |    |
| <212> DNA                        |    |
| <213> Artificial Sequence        |    |
| <220>                            |    |
| <223> Primer                     |    |
| <400> 41                         |    |
| tcgaggtctc atggatcata cagaatcagg | 30 |
| <210> 42                         |    |

<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 42  
caatgtgaga tgtctccagc

20

<210> 43  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 43  
ccttgtagat tgcaggcaga

20

<210> 44  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 44  
ggactcccat ccagtgtctc cagaagtgtat

30

<210> 45  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 45  
gagtagcagc tcagactgcc

20

<210> 46  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 46  
gttagacctct gggagctcct

20

<210> 47  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 47  
cgcagcactc agactacgtg cacctctgca 30

<210> 48  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 48  
gcagctgctc aactaatcac 20

<210> 49  
<211> 20  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 49  
tcagcagcac aagtcccact 20

<210> 50  
<211> 30  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 50  
acgggcattc ttattagtca gattattggt 30

<210> 51  
<211> 16  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 51  
aggcttcttc tacaca 16

<210> 52  
<211> 16  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 52

caggctgcct gcacca

16

<210> 53  
<211> 16  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 53  
aggcagagga cctgca

16

<210> 54  
<211> 10  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 54

Cys Phe Ile Ala Trp Leu Val Lys Gly Arg  
1 5 10

<210> 55  
<211> 24  
<212> DNA  
<213> Artificial Sequence

<220>  
<223> Primer

<400> 55  
gggtggtgag ggttgaggtt tgtg

24